JAPANESE PATENT OFFICE (JP)

PATENT JOURNAL (A)

KOKAI PATENT APPLICATION NO. HEI 5-245090

Technical Indication Section

Int. Cl.[5]:	A 47 L 13/17
Identification Code:	A
Sequence Nos. for Office Use:	FI 2119-3B
Filing No.:	Hei 4-45415
Filing Date:	March 3, 1992
Publication Date:	September 24, 1993
No. of Claims:	9 (Total of 11 pages in the [Japanese] document)
Examination Request:	Not filed

CLEANING ARTICLE AND PRODUCTION OF SAME

[Seisohyoh buppin oyobi sono seizoh houhoh]

Inventor(s): Nobuya Satoh
4594 Shigai-shi
Hoga-gun, Tochigi-ken

Seiko Narigoma
3-9-7-307 Higashi
Shukugo, Utsunomiya-shi
Tochigi-ken

Applicant(s): 000000918
Kao Corp.
1-14-10 Kayaba-cho
Nihonbashi, Chuo-ku
Tokyo

Agent(s): Osamu Hatori
Patent attorney

[*There are no amendments to this patent.*]

[*Translator's note: Names of products and companies are spelled phonetically in this translation.*]

Specification

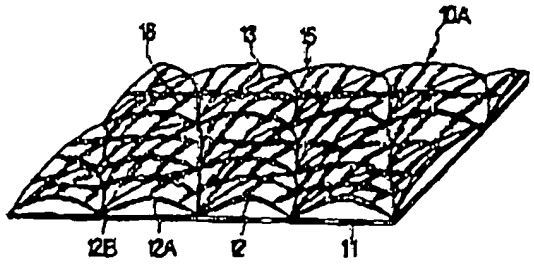
[Title of the invention]

Cleaning article and production of same

[Abstract]

[Problems to be solved] To produce a cleaning article having high dust collection efficiency for a wide range of dust from fine dust to relatively large material such as bread crumbs and having a collection efficiency less likely to be influenced by the shape of the cleaning surface, and to provide a manufacturing method of same.

[Constitution] In cleaning article 10A of the present invention, a foundation cloth 12 comprising a nonwoven fabric formed as a result of entanglement of fibers is partially bonded to one or both surfaces of base sheet 11, the bonded area of the above-mentioned foundation cloth forms recessed members 12B and the non-bonded area forms raised members 12A and as a whole, the sheet has a relief pattern, and furthermore, 0.1 to 80% of oil component is included for the weight of the foundation cloth.



[Claims of the invention]

[Claim 1] A cleaning article characterized by the fact that a foundation cloth comprising a nonwoven fabric formed as a result of entanglement of fibers is partially bonded to one or both surfaces of a base sheet, the bonded area of the above-mentioned foundation cloth forms recessed members and the non-bonded area forms raised members and, as a whole, having a relief pattern, and furthermore, 0.1 to 80% of an oil component is included for the weight of the foundation cloth.

[Claim 2] The cleaning article described in claim 1 characterized by the fact that the above-mentioned foundation cloth has an area greater than the aforementioned base sheet and having the supported area partially bonded to the base sheet and supported by the aforementioned base sheet and a free-end area that extends from the aforementioned base sheet.

[Claim 3] The cleaning article described in claim 1 characterized by the fact that a nonwoven fabric not solidified as a result of entanglement of fibers having a greater distance between fibers than that of the aforementioned foundation cloth is laminated onto the outer side of the aforementioned foundation cloth.

[Claim 4] The cleaning article described in claim 1 characterized by the fact that shedding occurs on the raised member of the aforementioned foundation cloth.

[Claim 5] The cleaning article described in one of claim 1 to claim 4 characterized by the fact that the aforementioned oil component includes one or more oil components selected among mineral oils, synthetic oils, silicone oils and surfactants.

[Claim 6] The cleaning article described in one of claim 1 to claim 5 characterized by the

fact that the viscosity (25 deg C) of the aforementioned oil component is in the range of 5 to 1000 cps.

[Claim 7] The cleaning article described in one of claim 1 to claim 6 characterized by the fact that the aforementioned cleaning article is mounted on a tool with a handle.

[Claim 8] A method of manufacturing the cleaning article described in claim 1, which method of manufacturing is characterized by the fact that the foundation cloth arranged on one or both surfaces of a heat-shrinkable base sheet is partially bonded to solidify, a heat-treatment is applied to the aforementioned base sheet and heat shrinking is achieved to form recessed members at the aforementioned bonded areas and raised members at the aforementioned non-bonded areas to form a cleaning article with an overall rough textured surface, and an oil component is impregnated to the aforementioned cleaning article before or after the aforementioned heat-treatment of the cleaning article.

[Claim 9] A method of manufacturing the cleaning article described in claim 1, which method of manufacturing is characterized by the fact that an oil component is impregnated in the aforementioned foundation cloth, the aforementioned foundation cloth is arranged on one or both surfaces of a heat-shrinkable base sheet, the aforementioned foundation cloth and base sheet are partially bonded to solidify, a heat-treatment is performed for the aforementioned base sheet and heat shrinking is achieved to form recessed members at the aforementioned bonded areas and raised members at the aforementioned non-bonded areas to form a cleaning article with an overall rough textured surface.

[Detailed description of the invention]

[0001]

[Field of industrial application] The present invention pertains to a commercial or household cleaning article made of a nonwoven fabric and to a method of manufacturing same.

[0002]

[Prior art] Historically, many different types of cleaning articles that utilize fiber materials as a

substrate have been introduced. For example, wet type or dry type wiping cloths made of a woven cloth or nonwoven fabric, simple sheets such as chemical wiping cloths, a bundled filament-like material represented by heads for mops, etc. are known and are widely used in homes, offices, stores, buildings, factories, etc.

[0003] In comparison to cleaning articles used as mops, dust removal from uneven surfaces is poor with cleaning articles consisting of a flat sheet such as a chemical dusting cloth. In an attempt to eliminate the aforementioned problem, a technology where stitching is provided for the nonwoven fabric with an elastic yarn to form gathers to provide bulkiness to the cleaning article is disclosed in Japanese Kokai [Unexamined] Patent Application No. Sho 64-61546. Also, a technology where an elastic fiber is used and gathering is done to provide bulkiness to the cleaning sheet (cleaning article) is disclosed in Japanese Kokai [Unexamined] Patent Application No. Hei 2-160962. And furthermore, a technology where the surface of the cleaning sheet is raised to provide improved dusting performance is disclosed in Japanese Kokai [Unexamined] Patent Application No. Hei 2-124122 and Japanese Kokai [Unexamined] Patent Application No. Hei 2-99641.

[0004]

[Problems to be solved by the invention] However, the above-mentioned sheet type or mop type cleaning articles have the problems described below associated with them. In general, mop type cleaning articles are effective for a relatively large particles such as bread crumbs existing on the surface to be cleaned and relatively large particles can be trapped between the mop cords as described in Japanese Kokai [Unexamined] Patent Application No. Sho 53-144156. However, the aforementioned dust is not entangled in the fibers that form the mop cords, and the dust is likely to fall off when the mop is raised. In addition to the aforementioned problem, many base materials are needed, handling ease is inferior to the sheet type, and cleaning performance for walls and ceilings is inferior.

[0005] A cleaning sheet made of a nonwoven fabric, etc. provided with bulkiness by means of stitching, etc. is less likely to be influenced by the shape of the cleaning surface, but control of the shape to accommodate a wide range of cleaning surfaces is difficult, and furthermore, the freeness of the structural fibers is reduced due to stitching, and collection performance for fine dust such as cotton dust and small fiber pieces is reduced. Furthermore, anisotropy is produced in the wiping direction of the sheet in all of the aforementioned products; thus, effective dust collection is not possible. Furthermore, retention of large particles such as bread crumbs is poor. In other words, removal of fine dust is possible, but removal of a relatively large particles is difficult and furthermore, lint is left behind at the time of cleaning due to friction.

[0006] Based on the above background, the present invention is to produce a cleaning article having superior collection efficiency for a wide range of dust from fine dust to a relatively large particles such as bread crumbs, collection efficiency not influenced by the shape of the cleaning surface, superior lint-free performance and excellent softness and appearance, and to provide a method of manufacturing same.

[0007]

[Means to solve the problem] The above-mentioned purpose of invention is achieved by a cleaning article characterized by the fact that a foundation cloth comprised of a nonwoven fabric formed as a result of entanglement of fibers is partially bonded to one or both surfaces of a base sheet, the bonded area of the above-mentioned foundation cloth forms recessed members and the non-bonded area forms raised members and as a whole, the sheet has a relief pattern, and furthermore, 0.1 to 80% of an oil component is included for the weight of the foundation cloth.

[0008] Furthermore, the present invention is a method of manufacturing characterized by the fact that the foundation cloth arranged on one or both surfaces of a heat-shrinkable base sheet is partially bonded to solidify, a heat-treatment is applied to the aforementioned base sheet and heat shrinking is achieved to form recessed members at the aforementioned bonded areas and raised members at the aforementioned non-bonded areas to form a cleaning article with an overall

rough textured surface, and an oil component is impregnated to the aforementioned cleaning article before or after the aforementioned heat-treatment of the cleaning article in a method of manufacturing the aforementioned cleaning article.

[0009] Furthermore, the present invention is a method of manufacturing characterized by the fact that an oil component is impregnated into the aforementioned foundation cloth, the aforementioned foundation cloth is arranged on one or both surfaces of a heat-shrinkable base sheet, the aforementioned foundation cloth and base sheet are partially bonded to solidify, a heat-treatment is applied to the aforementioned base sheet and heat shrinking is achieved to form recessed members at the aforementioned bonded area and raised members at the aforementioned non-bonded areas to form a cleaning article with an overall rough textured surface in the manufacture of a cleaning article.

[0010] In the present invention, the base sheet is a sheet without shrinkable pores, and the concept is a sheet that excludes the mesh sheet and porous sheet described in Japanese Patent Application No. Hei 3-297489.

[0011]

[Work of the invention] The cleaning article of the present invention has many soft rugged surfaces on a foundation cloth used for dusting surfaces, and easily accommodates the shape of the surface to be cleaned, and uncleaned areas are less likely to occur. In the cleaning article of the present invention, the foundation cloth made of nonwoven material is partially bonded with the base sheet and many raised areas are formed on the dusting surface of the foundation cloth, and collection of a wide range of dust size from fine dust to relatively large pieces such as bread crumbs and human hair is made possible.

[0012] The cleaning article of the present invention has many soft raised surfaces on a foundation cloth used as the dusting surface, and it easily accommodates complicated shapes of surfaces to be cleaned, and uncleaned areas are less likely to occur.

[0013]

[Working Examples] The working examples of the present invention are explained in further detail with reference to the attached drawings. Fig. 1 is a top view of the cleaning sheet of the first working example of the present invention. Fig. 2 is an enlarged perspective view of a cut-out portion of the cleaning sheet shown in Fig. 1. Fig. 3 is a schematic view of the device used for production of the cleaning sheet of the first working example. Fig. 4 is an enlarged perspective view of the cut portion of the cleaning sheet of the second working example. Fig. 5 is a top view of the cleaning sheet shown in the third working example. Fig. 6 is an enlarged perspective view at a cut portion of the cleaning sheet shown in Fig. 5. Fig. 7 is an enlarged perspective view at a cut portion of the cleaning sheet of the fourth working example. Fig. 8 is a top view of the cleaning sheet of the fifth working example. And Fig. 9 is a top view of the cleaning sheet of the sixth working example.

[0014] First, cleaning sheet (cleaning article) 10A of the first working example of the present invention is explained using Fig. 1 to Fig. 3 as references. In the cleaning sheet 10A of this working example, nonwoven ground fabric 12 formed as a result of entanglement of fibers is partially bonded to one or both surfaces of base sheet 11 and solidified, and cleaning sheet 10A has a rugged member on the surface as a whole where the bonded area forms recessed member 12B and the non-bonded area forms raised member in the of above-mentioned foundation cloth 12, and 0.1 to 80% of an oil component for the weight of the aforementioned foundation cloth 12 is deposited, and furthermore, a nonwoven fabric net solidified as a result of entanglement of fibers having a greater distance between fibers than that of the aforementioned foundation cloth is laminated onto the outer side of the aforementioned foundation cloth.

[0015] For base sheet 11, a heat-shrinkable material is used, and for example, polyolefins such as polyethylene, polypropylene and polybutene, polyesters such as polyethylene terephthalate and polybutylene terephthalate, vinyls and vinylidenes such as polyvinyl chloride, polyvinylidene chloride, modified synthetic resins of same, mixture of two or more of same,

films or sheets made of a composite material containing the aforementioned synthetic resins, etc. may be used, and those that undergo shrinkage in a uniaxial or biaxial direction to form the above-mentioned raised members 12A and recessed members 12B on the foundation cloth 12 are suitable.

[0016] The thickness of the aforementioned base sheet 11 can be adjusted appropriately according to the shrinkage force, shape of the rough textured surface based on the shrinkage factor, degree of roughness, bonding performance with the foundation cloth, etc. The foundation cloth is a nonwoven fabric, and the type of nonwoven fabric used is not especially limited, in this case, as long as the material is integrated as a result of entanglement of the structural fibers, and it is desirable when a fiber with the higher degree of freeness achieved as a result of entanglement of structural fibers is used rather than a nonwoven fabric obtained by mutual fusion of structural fibers for trapping of fine dust, but when the degree of freeness of the structural fibers is too high, detachment of the structural fibers is likely to occur.

[0017] Furthermore, the aforementioned foundation cloth 12 has a structure comprising entangled fibers, and fine dust adsorbed to the cleaning surface is trapped by the aforementioned structural fibers. Furthermore, relatively long and hard dust such as human hair can be entrapped by the combination of structural fibers of the nonwoven fabric as well. For the structural fibers of the aforementioned foundation cloth 12, synthetic fibers such as polyester fibers, polyamide fibers, polyolefin fibers and acrylic fibers, composite fibers of each of the aforementioned resin, semi-synthetic fibers such as acetate, recycled fibers such as cupra and rayon, or natural fibers such as cotton, linen, sheep's wool, etc., or blend fibers of same can be mentioned, and when bonding of the aforementioned base sheet 11 and foundation cloth 12 is achieved by a heat-treatment such as heat roll, use of thermoplastic resins is especially desirable from the standpoint of increased adhesion.

[0018] It is desirable when the degree of freeness of the aforementioned structural fibers is high, however, in order to prevent a high proportion of detachment of the fibers when made into a

foundation cloth or to increase the strength, a binder fiber may be mixed or a part of the binder fiber may be fused or bonded with the structural fiber as well. Furthermore, detachment of the fiber may be prevented by mixing an appropriate amount of a powder bond. And selection is made taking trapping performance for fine dust and strength of the foundation cloth into account.

[0019] Furthermore, the basis of the foundation cloth can be determined taking many factors such as degree of entanglement, strength, processability, and cost of the structural fiber into account, and in general, 30 to 150 g/m^2 is desirable. When the basis is 30 g/m^2 or below, the degree of entanglement and strength are insufficient; on the other hand, when the basis exceeds 150 g/m^2, a cost increase results. It is desirable when the size of the structural fibers of the aforementioned foundation cloth 12 is in the range of 0.5 to 6.0 denier. When the fiber size is 0.5 denier or below, web formability of the fiber is reduced; on the other hand, when the fiber size exceeds 6.0 denier, entanglement of the fiber is less likely to occur and trapping of the fine dust becomes difficult.

[0020] The area not in contact with the aforementioned base sheet 11 that is surrounded with the lattice-like bonded member 13 is formed as raised member 12A on the above-mentioned foundation cloth 12, and a rough textured surface is formed as the cleaning surface over the entire cleaning sheet. A cleaning surface with high bulkiness is formed with the aforementioned many raised members 12A and recessed members 12B and a cleaning surface that is more likely to be conformable to the shape of the surface being cleaned is formed.

[0021] For the height of the raised members 12A above the recessed members 12B formed on the cleaning surface, a distance between the center of the base sheet 11 and the center of the foundation cloth 12 in the range of 1 to 30 mm is desirable. When the aforementioned thickness is 1 mm or below, adequate bulkiness and conformity with the cleaning surface cannot be achieved; on the other hand, when 30 mm or above, many foundation cloths are needed and the cost is increased. Furthermore, slit openings 12C may be formed for the aforementioned raised members 12A as shown in the third working example below.

[0022] As shown in Fig. 2, nonwoven fabric net 16 having a long distance between fibers is arranged on the outer side (opposite side from base sheet 11) of foundation cloth 12, and the aforementioned nonwoven fabric net is partially bonded with the foundation cloth at bonding areas 13. In other words, the non-bonded area between the above-mentioned base sheet 11 and nonwoven fabric net 16 is formed as raised member 12A and bonded areas are formed at base sheet 12B. And a cleaning surface with high bulkiness is formed with the above-mentioned foundation cloth 12. As explained above, when the aforementioned nonwoven fabric net 16 is provided, relatively large particles such as bread crumbs can be efficiently trapped.

[0023] The bonding area 13 formed as a result of partial bonding of the aforementioned base sheet 11 and foundation cloth 12 is a continuous dotted pattern and is formed into a lattice as shown in Fig. 1. The shape of the aforementioned bonding area 13 between the base sheet 11 and foundation cloth 12 and nonwoven fabric net 16 is not especially limited, and in order to retain softness of the sheet, dot bonding, rather than line bonding, is desirable.

[0024] The smaller the size of the dots at the aforementioned bonding area 13, the less likely the softness is to be lost. Therefore, the area and number of dots at the bonding area is designed to be an area where the base sheet 11, foundation cloth 12, and nonwoven fabric net 16 are bonded to have a practical strength. Furthermore, in comparison to the nonwoven fabric used for the aforementioned foundation cloth 12, it is necessary for the distance between fibers in the nonwoven fabric net 16 to be greater. The type and size of the structural fiber is the same as in the case of the above-mentioned foundation cloth 12, and for entanglement of the fiber, a water jet is applied to the web. In this case, the degree of entanglement has a correlation with the trapping of dust. Furthermore, depending on the type, properties, basis, etc. of the structural fiber, the strength of the nonwoven fabric varies.

[0025] And furthermore, the strength of the nonwoven fabric is highly influenced by distance (a) between fibers defined by equation (1) below.

[0026]

[Equation 1] $a = (DV/9000W)^{1/2}$ ..... (1)

V: volume of nonwoven fabric (m^3)

W: weight of nonwoven fabric (g)

In this case, the volume V of the nonwoven fabric can be obtained from the thickness and area under a no-load condition.

[0027] When the distance between fibers is too great, the strength is reduced; on the other hand, when the distance between fibers is too small, freeness of the fiber is reduced and entanglement of relatively large particles such as bread crumbs cannot be achieved efficiently. In specific terms, the distance between fibers of the foundation cloth 12 is 80 μm or below, the distance between fibers of the nonwoven fabric net 16 is 50 μm or below, and the distance between fibers of the foundation cloth and the distance between fibers of the nonwoven fabric net satisfies the relationship shown in equation (2) below.

[0028]

Distance between fibers of the foundation cloth 12 < distance between fibers of the nonwoven fabric net 16 ..... (2)

Furthermore, the spacing of the fibers and voids may be regular or random. However, when the voids are too large, entanglement of relatively large particles such as bread crumbs becomes difficult, and when the voids are too small or the basis is too large, dusting effectiveness of the foundation cloth 12 is inhibited. Furthermore, after laminating the structural fiber web of nonwoven fabric net 16 onto the surface of foundation cloth 12 to form a pattern such as stripes or a lattice, water-jet entanglement (water needling) may be applied to form nonwoven fabric net 16 on the surface of the foundation cloth as well.

[0029] Furthermore, the distance between fibers of the aforementioned nonwoven fabric net 16 is relatively large; thus, the strength as a nonwoven fabric is reduced and lint is likely to be formed. Thus, it is desirable when a hot-melt fiber such as a binder fiber is substantially absent from the cleaning surface and the side of the foundation cloth 12 opposite from the cleaning

surface is firmly bonded with the foundation cloth so as to prevent a reduction in the surface properties of the nonwoven fabric net and to increase strength.

[0030] In specific terms, after laminating fiber web layer A containing a hot-melt resin and fiber web layer B without a hot-melt resin, that is, a fiber comprising a fiber with high cleaning performance, the aforementioned nonwoven fabric net 16 is integrated by means of the water-jet entanglement method, etc. In this case, web layer A and web layer B are less likely to form a completely random arrangement, and the degree of entanglement, etc. is selected through adjustment of the water pressure used for the aforementioned water-jet entanglement method.

[0031] Subsequently, a part of the structural fiber of fiber web layer B is bonded by the hot-melt resin included in the fiber web layer A by means of a heat treatment. Furthermore, voids may be formed by punching the above-mentioned nonwoven fabric, etc. or when the nonwoven fabric is formed by the water-jet entanglement method, a mesh with large voids may be used for the net of the base at the time of the fiber entanglement of the web.

[0032] The dimensions of cleaning sheet 10A of the present invention is determined appropriately according to the cleaning surface or location of the cleaning area or shape of the cleaning area, etc., and the length of the side perpendicular to the dusting direction is in the range of 5 to 150 cm, preferably, 10 to 140 cm for home use and 10 to 150 cm for commercial use. As shown in Fig. 1, cleaning sheet 10A has the main unit 15 and free-end area 14 at the border, and it is desirable when the free-end area 14 is 1/30 to 1/2 of the size of main unit 15 from the boundary of the main unit to the edge. When the ratio is outside of the aforementioned range, the sheet does not accommodate areas such as corners of the surface to be cleaned and dust trapping performance is reduced.

[0033] It is desirable when the aforementioned oil component deposited on the aforementioned cleaning sheet 10A includes one or more oil components selected from mineral oils, synthetic oils, silicone oils, and surfactants. For the aforementioned mineral oils, paraffin based hydrocarbons, naphthene based hydrocarbons, aromatic hydrocarbons, etc. can be mentioned.

For the aforementioned synthetic oils, alkylbenzene oils, polyolefin oils, polyglycol oils, etc. can be mentioned, and for silicone oils, chain dimethylpolysiloxane, ring dimethylpolysiloxane, methyl hydrogen polysiloxane, and various modified silicones can be mentioned.

[0034] For the above-mentioned surfactants, cationic surfactants such as quaternary ammonium salts, nonionic surfactants such as a polyethylene glycol or polyhydric alcohol can be used effectively. The viscosity of the aforementioned oil component (25 deg C) is in the range of 5 to 1000 cps, preferably in the range of 5 to 200 cps. When the viscosity is 5 cps or below, adsorption of dust is poor; on the other hand, when the viscosity exceeds 1000 cps, uniform permeation of the aforementioned oil component is less likely to occur in the fiber, and coefficient of friction with the cleaning surface is increased; thus, it can cause scratches on the cleaning surface. The surface tension (25 deg C) is in the range of 15 to 45 dyn/cm, and 20 to 35 dyn/cm is further desirable. When the surface tension is 15 dyn/cm or below, adsorption of dust is poor; on the other hand, when the surface tension exceeds 45 dyn/cm, uniform permeation of the aforementioned oil component in the fiber is less likely to occur.

[0035] The amount of the oil component deposited is in the range of 0.1 to 80%, preferably, 0.5 to 40%, and especially, 1 to 20%, for the weight of the foundation cloth, and in this case, dust adsorption performance and dust retention performance can be enhanced. When the amount of the oil component deposited is 0.1 or below, the increase in dust adsorption performance and dust retention performance based on the aforementioned oil component is insufficient; on the other hand, when the aforementioned amount exceeds 80%, tackiness to the fingers increases.

[0036] As described above, it is desirable when the aforementioned oil component includes one or more oil components selected from mineral oils, synthetic oils, silicone oils and surfactants, and the amount, type, viscosity and surface tension, etc. of the oil component is determined appropriately according to the cleaning purpose and type of structural fiber of the nonwoven fabric used. A desirable embodiment of the method of manufacturing the cleaning sheet (cleaning article) 10A of concern in the present invention is explained in detail below.

[0037] As shown in Fig. 3, in the manufacturing process of the present invention, foundation cloth 12 is partially bonded to one or both surfaces (one surface in this case) of heat-shrinkable base sheet 11 to integrate, a heat-treatment is applied to the above-mentioned base sheet and thermal shrinkage is achieved to form recessed members 12B at the above-mentioned bonded areas and raised members 12A in the non-bonded areas and to form a cleaning sheet having a rough textured surface for the entire surface, then, an oil component is impregnated to the aforementioned cleaning sheet before or after heat-treatment of the aforementioned cleaning sheet.

[0038] First, foundation cloth 12 wound on a roll is unwound by supply roll 21. Slit openings 12C (described below) are formed in the unwound foundation cloth by shedding machine 23. The aforementioned shedding machine is equipped with rotary die cutter 23A and anvil roll 23B and is set to form many slit openings 12C as the aforementioned foundation cloth 12 passes through the aforementioned rotary die cutter 23A. However, the aforementioned shedding machine 23 is not required when slit openings 12C are not formed. Furthermore, the shedding machine may be provided at a stage of the process after arranging nonwoven fabric net 16 described below to form slit openings 12C, as well.

[0039] Meanwhile, base sheet 11 and nonwoven fabric net 16 are unrolled and arranged on the path of the transport line of foundation cloth 12, and the base sheet and nonwoven fabric net supplied from each roll are superposed with the foundation cloth 12 by guide rolls 24A and 24B. In this case, the base sheet and nonwoven fabric net are arranged with the foundation cloth in between, and bonded by bonding machine 25 in a dotted pattern.

[0040] The bonding machine 25 is equipped with horn 25A that generates ultrasonic waves and emboss roll 25B having a specific dot pattern, and bonding is performed while the superposed base sheet 11, foundation cloth 12 and nonwoven fabric net 16 are passed through to form lattice-like bonding areas 13 as shown in Fig. 1.

[0041] Furthermore, for the bonding method used with the above-mentioned bonding machine, a

method where an adhesive is coated on one or both of the base sheet and foundation cloth, or a method where heat and pressure are applied, etc. can be mentioned, and when bonding is done with an adhesive, it is necessary to use an adhesive having an adequate adhesive strength so as to prevent peeling at the time of heat shrinkage of the base sheet, and, at the same time, absence of bleeding of the adhesive on the non-bonding surface of the foundation cloth from the standpoint of stable fabrication.

[0042] In the method where heat and pressure is used, it is necessary to select a material where the base sheet and foundation cloth undergo mutual fusion or bonding based on anchoring effect. In specific terms, heat embossing and the ultrasonic wave method can be mentioned, and selection of the method is done according to the fabrication rate and materials used. A heating method other than the aforementioned ultrasonic wave method may be used, as well, and selection of the method is done according to the fabrication rate and materials used.

[0043] After the base sheet 11, foundation cloth 11 and nonwoven fabric net 16 are integrated, the aforementioned base sheet 11 and nonwoven fabric net 16 are transported to oil component coating machine 26 and the oil component is coated onto the aforementioned base sheet 11 and nonwoven fabric net 16. The aforementioned oil component 26 has a structure comprising gravure roll 26A that transports an appropriate amount of oil component to the aforementioned integrated sheet, backup roll 26B that presses the integrated sheet against the aforementioned gravure roll 26A and solution container 26C that contains the oil component.

[0044] A roll coater is used for coating machine 26 in Fig. 3, but a spray method may be used, as well, and the method used is selected appropriately based on the fabrication rate, selection of materials, etc. Furthermore, coating of oil component based on spray method is effective at the time of application of the oil component after thermal shrinkage.

[0045] After coating with the oil component, the aforementioned sheet is fed by nip rolls 27 and transported to thermal treatment equipment 28. The aforementioned heat-treatment machine 28 is used to heat shrink the base sheet and is set at temperature suitable for heat-shrinking the base

sheet. While the sheet consisting of the base sheet and foundation cloth passes through the aforementioned thermal treatment equipment 28, the base sheet alone undergoes shrinkage and the foundation cloth and nonwoven fabric net remain unshrunk; thus, raised members and recessed members based on the embossed pattern are formed on the aforementioned foundation cloth and nonwoven fabric net. In this case, the temperature and time are set to achieve the target area shrinkage ratio, and it is desirable when the speed ratio of nip rolls 27 at the upstream side and nip rolls 29 at the downstream side of the aforementioned thermal treatment equipment 28 are adjusted to the target area shrinkage ratio.

[0046] In this case, the aforementioned area shrinkage ratio is shown in equation (3) below.

[0047]

[Equation 2] [sic]

Shrinkage ratio = [(length of one side before shrinkage) - (length of side after shrinkage)] / (length of side before shrinkage) (%) ..... (3)

After passing through the aforementioned thermal treatment equipment 28, the sheet is fed by nip rolls 29 and taken-up by winder 30.

[0048] Furthermore, different working examples of the present invention are explained using Fig 4 to Fig. 9 as references. Cleaning sheet 10B of a second working example of the present invention is shown in Fig. 4. In this case, foundation cloth 12 is arranged on both surfaces of base sheet 11 and nonwoven fabric net 16 is arranged at the outer side of each foundation cloth. In other words, the foundation cloth and nonwoven fabric net of the above-mentioned first working example are arranged on both sides of the nonwoven fabric net and base sheet.

[0049] Fig. 5 and Fig. 6 show cleaning sheet 10C of the third working example. In this case, foundation cloth 12 alone is provided on one surface of the base sheet and nonwoven fabric net 16 is omitted. Furthermore, slit openings 12C are formed on each raised member 12A and relatively large particles are less likely to be caught by the above-mentioned structural fiber can be trapped inside each raised member 12A through the aforementioned slit openings 12C.

[0050] In the case of the aforementioned third working example, it is desirable when the opening area of slit openings 12C is in the range of 1 to 100 mm^2. When the aforementioned value is 1 mm^2 or below, type of dust entrapped by the slit opening 12C is limited and dust such as bread crumbs is less likely to be caught; on the other hand, when the value exceeds 100 mm^2, the dust collected is likely to fallout. It is desirable when the ratio of the slit opening 12C for the cleaning surface is 5 to 60%. When aforementioned ratio is below 5%, trapping of dust is difficult; on the other hand, when the ratio exceeds 60%, trapping of fine dust by the foundation cloth is reduced and it is not practical.

[0051] When an adhesive with low tack is coated on one or more of the inside the surfaces of the non-bonded area the above-mentioned base sheet 11 and the aforementioned nonwoven fabric net 12 [sic], detachment of dust caught by the above-mentioned slit openings 12C can be prevented. In this case, after forming the above-mentioned nonwoven fabric 12 [sic] into a sheet, the slit openings 12C are formed by partially slitting the sheet, but the slit openings may be formed by a punching process, as well. Furthermore, when the nonwoven fabric is formed by a method such as the water-jet method, formation of the above-mentioned slit openings 12C is made possible when a coarse mesh is used for the net of the substrate.

[0052] Cleaning sheet 10D of the fourth working example of the present invention is shown in Fig. 7. In this case, foundation cloth 12 is arranged on both sides of the base sheet 11 and raised members 12A are formed on both surfaces of the base sheet at random. Cleaning sheet 10E of the fourth working example of the present invention is shown in Fig. 8. In this case, free end 14, which is not bonded with the base sheet, is provided at the border of main unit 15. In other words, foundation cloth 12 consisting of fiber web is partially bonded with one or both surfaces of base sheet 11 having an area smaller than that of the foundation cloth, and main unit 15 is formed at the area corresponding to the base sheet and free ends 14 are formed on both ends (two sides).

[0053] Cleaning sheet 10E [sic] of the fifth working example of the present invention is shown

in Fig. 9. Unlike the case of the above-mentioned fourth working example having free ends on two sides, free ends 14 are formed at all boundaries (four sides) in the fifth working example. A product of the present invention is explained in specific terms in comparison to a product of prior art below.

[0054] (Product 1 of the invention) As a foundation cloth, a polyester fiber of 1.5 denier and 51 mm was used and standard carding was done to produce a fiber web with a basis of 10 g/m^2, and the aforementioned fiber web was wrapped to form 6 layers (60 g/m^2) and entanglement was done by the water-jet method. In this case, the water jet used is equipped with four blocks of nozzle heads with a nozzle pitch of 1.6 mm in the MD direction, the water pressure was 40 kg/cm^2 and velocity was 5 m/min.

[0055] As a base sheet, a biaxially shrinkable polypropylene film (Gunze Co., (Ltd.)) with a thickness of 15 μm and having an area the same as that of the foundation cloth was used and superposed with the above-mentioned foundation cloth, and bonding was done by an ultrasonic embossing device. In this case, the bonding pattern consisted of circles with a diameter of 2 mm arranged in a row at intervals of 1.84 mm, and is arranged in such a manner that the aforementioned pattern forms a continuous diamond shape with diagonal lines of 39.27 mm and 24.17 mm, then, a heat-treatment was applied for 30 seconds at 110 deg C to produce a cleaning sheet having an area shrinkage ratio of approximately 10%.

[0056] For the oil component, an oil component consisting of 95% liquid paraffin and 95% nonionic surfactant [polyoxyethylene (mean adduct molar number 3.3) alkyl (C_{12}-C_{13}) ether] (viscosity 125 cps, surface tension 30 dyn/cm) was spray coated onto the aforementioned cleaning sheet at a ratio of 5% for the weight of the fiber (weight of the foundation cloth) to produce product 1 of invention. In this case, the size used for evaluation was adjusted to form 7 x 11 cm.

[0057] (Product 2 of invention) Slits were formed in the foundation cloth of the aforementioned product 1 of the invention to form slit openings for raised members having a diamond shape. In

this case, slit openings with a length of 25 mm were formed in such a manner that the intersection of the longer diagonal line and the shorter diagonal line of the diamond form the center. The rest of the conditions are the same as the aforementioned product 1 of the invention.

[0058] (Product 3 of invention) As a foundation cloth, a polyester fiber of 1.5 denier and 51 mm was used and standard carding was done to produce a fiber web with a basis of 10 g/m^2, and the aforementioned fiber web was wrapped to form 6 layers (60 g/m^2) and entanglement was achieved by the water-jet method. In this case, the water jet used is equipped with four blocks of nozzle heads with a nozzle pitch of 1.6 mm in the MD direction, the water pressure was 40 kg/cm^2 and velocity was 5 m/min.

[0059] As a base sheet, a biaxially shrinkable polypropylene film (Gunze Co., (Ltd.)) with a thickness of 15 μm and having an area 80% of that of the foundation cloth was used and superposed with the above-mentioned foundation cloth, and bonding was done by an ultrasonic embossing device. In this case, the bonding pattern consists of circles with a diameter of 2 mm arranged in a row at intervals of 1.84 mm, and the arrangement is such that the aforementioned pattern forms continuous diamond shapes with diagonals of 58.91 mm and 36.26 mm.

[0060] For the oil component, silicone (Toray Silicone Co., SM5571) was applied to the foundation cloth at a ratio of 10%, and a heat-treatment was applied for 30 seconds at a temperature of 120 deg C to produce product 3 of invention having a shrinkage factor of approximately 20%. In this case, the size used for evaluation was adjusted to form 7 x 11 cm, and the free-end area was adjusted to extend approximately 17 mm from each of the 7 cm sides.

(Product 4 of invention) As a foundation cloth, a polyester fiber (Teijin Co., (Ltd.)) of 1.5 denier and 51 mm was used and standard carding was done to produce a fiber web with a basis of 10 g/m^2, and the aforementioned fiber web was wrapped to form a 6 layer (60 g/m^2) and entanglement was done by the water-jet method. In this case, the water jet used is equipped with four blocks of nozzle heads with a nozzle pitch of 1.6 mm in the MD direction, the water pressure was 40 kg/cm^2 and velocity was 5 m/min.

[0061] As a nonwoven fabric net, standard carding was done for a polyester fiber (Teijin Co., (Ltd.)) of 3 denier and 76 mm to form a fiber web with a basis of 10 g/m^2; then, a fiber web produced by standard carding of a polypropylene/polyethylene core-shell fiber (Chisso Co., (Ltd.)) of 3 denier and 51 mm was laminated, entanglement was achieved by the water-jet method to punch out many circles with a diameter of 15 mm and center-to-center distance of 20 mm. In this case, water-jetting was done under a water pressure of 20 kg/cm^2 and the rest is the same as described above.

[0062] As a base sheet, a biaxially shrinkable polypropylene film (Gunze Co., (Ltd.)) with a thickness of 15 μm and having an area the same as that of the foundation cloth was used and superposed with the above-mentioned nonwoven fabric net in such a manner that free ends are provided on two sides that face the aforementioned foundation cloth and nonwoven fabric net and bonding was done by an ultrasonic embossing device. In this case, the bonding pattern consists of circles with a diameter of 2 mm arranged in a row at intervals of 1.84 mm, and they are arranged in such a manner that the aforementioned pattern forms continuous diamond shapes with a diagonal line of 39.27 mm and 24.17 mm, then, a heat-treatment was applied for 30 seconds at 110 deg C to produce a cleaning sheet having an area shrinkage ratio of approximately 10%.

[0063] For the oil component, an oil component consisting of 95% of liquid paraffin and 95% of nonionic surfactant [polyoxyethylene (mean adduct molar number 3.3) alkyl (C_{12}-C_{13}) ether] (viscosity 125 cps, surface tension 30 dyn/cm) was spray coated onto the aforementioned cleaning sheet at a ratio of 5% for the weight of the fiber (weight of the foundation cloth).

[0064] In this case, the size used for evaluation was adjusted to form 7 x 11 cm. And furthermore, the free-end area was adjusted to extend approximately 17 mm from each of the 7 cm sides.

(Comparison product 1) In product 1 of the invention, the shrinkage process was omitted and a product without a rough textured surface was produced as comparison product 1; otherwise, production was as in the case of product 1 of invention.

[0065] (Comparison product 2) In product 1 of the invention, application of an oil component was omitted, and the product was used as comparison product 2. Otherwise, production was as in the case of product 1 of invention. For each of the above-mentioned products of the present invention and comparison products, an evaluation was made according to the methods described below.

[0066] 1. Cleaning performance on irregular surface

to be cleaned, 1 g each of 7 types of test dust having compositions similar to dirt and sand (JIS Z8901) was uniformly scattered onto a cleaning surface having grooves with widths of 3 cm and depths of 3 mm and 5 mm, and each of the above-mentioned products of the invention and comparison products were attached to a sponge with a size of 7 x 11 cm and cleaning of the aforementioned grooves was done with 10 reciprocating motions and state of cleaning of the grooves was examined visually.

[0067] The criterion used for visual examination is as shown below.

OO: No dust left in grooves with depths of 3 mm and 5 mm.

O: No dust left in grooves with depth of 3 mm, but dust is left in grooves with depth of 5 mm.

Δ: Small amount of dust left in grooves with a depth of 3 mm, but dust left in grooves with a depth of 5 mm.

[0068] x: Significant amount of dust left behind in both grooves with a depth of 3 mm and 5 mm.

2. Cleaning performance at corners

1 g each of 7 types of test dust having compositions similar to dirt and sand (JIS Z8901) was uniformly scattered onto a cleaning surface consisting of three planes that intersect and each of the above-mentioned products of the invention and comparison products was attached to a

sponge with a size of 7 x 11 cm and cleaning was done in 10 reciprocating motions and state of cleaning of the grooves [sic] was visually examined.

[0069] The criterion used for visual examination is as shown below.

OO: No dust is left in the corner where two vertical surfaces and a horizontal surface intersect.

O: Dust is left in the above-mentioned upper part [sic], but no dust is left in the corner where one vertical surface and horizontal surface intersect.

Δ: A fair amount of dust is left in the corner where two vertical surfaces and a horizontal surface intersect, and a slight amount of dust is left in the corner where one vertical surface and one horizontal surface intersect.

[0070] X: A fair amount of dust is left in each corner.

3. Bread crumb collection efficiency

1 g of bread crumbs (Soft bread crumbs of Nisshin Mills Co., (Ltd.)) was scattered in an area of 30 x 30 cm, and each of the above-mentioned products of invention and comparison products was attached to a sponge with a size of 7 x 11 cm and cleaning was done over the aforementioned grooves in 3 reciprocating motions and the state of cleaning was visually examined.

[0071] The criterion used for the visual examination is as shown below.

OO: Most of the bread crumbs were securely caught and detachment of the bread crumbs was less likely to occur.

O: Most of the bread crumbs were caught but detachment of bread crumbs occurred at times.

Δ: Some of the bread crumbs were caught but the bread crumbs were likely to detach.

X: hardly any bread crumbs were caught.

[0072]

[Table I]

		Cleaning performance for irregular cleaning surface	Cleaning performance at corners	Bread crumb collection efficiency
Products of the invention	1	OO	O	Δ
	2	OO	O	O
	3	OO	OO	Δ
	4	OO	OO	OO
Comparison products	1	Δ	Δ	X
	2	Δ	Δ	X

As is clearly shown in Table I, according to the cleaning sheet of the products of the invention, excellent dust collection efficiency can be achieved for all of the above-mentioned cleaning surfaces and excellent results were achieved.

[0073] Furthermore, the products of the present invention are capable of catching fine dust such as lint as well as relatively large particles such as bread crumbs, efficiently. Collection efficiency of bread crumbs is poor in comparison products, but excellent results were achieved in the products of the present invention. In particular, in product 4 of the invention where a nonwoven fabric net is arranged outside the foundation cloth, excellent cleaning performance was achieved in all of the aforementioned cleaning areas and collection of a wide range of dust can be done efficiently.

[0074] Thus, according to the present invention, excellent fine dust adsorption as well as good collection efficiency for relatively large materials such as hair and bread crumbs can be

achieved. The present invention is not limited to the above-mentioned working examples and many modifications within the range of the invention are possible. For example, the deposition method of the oil component on the cleaning sheet may be a method where the aforementioned cleaning sheet is dipped in an oil component.

[0075] Furthermore, in addition to use of the sheet as a hand duster, the cleaning sheet may be attached to a pole and used as a mop as well. The type of pole used in this case is not especially limited, and for example, mops, handy-mops, stick dusters, etc. can be mentioned, but, it is desirable when the cleaning member is macroscopically flat. And furthermore, in the manufacturing method of the present invention, a method where the foundation cloth is impregnated with an oil component, the aforementioned foundation cloth is arranged on one or both surfaces of a heat-shrinkable base sheet, partial bonding is performed for the aforementioned foundation cloth and base sheet, heat is applied to the aforementioned base sheet to form the aforementioned raised members and recessed members on the surface so as to form a cleaning article having a rugged surface on the surface may be used as well.

[0076]

[Effect of the invention] The cleaning article of the present invention is a cleaning article having superior collection efficiency for a wide range of dust from fine dust to relatively large particles such as bread crumbs, and collection efficiency not influenced by the shape of the cleaning surface. Furthermore, according to the method of manufacturing the cleaning article of the present invention, production of the aforementioned cleaning article can be done efficiently.

[Brief description of the figures]

[Fig. 1] A top view of the cleaning sheet of the first working example of the present invention.

[Fig. 2] An enlarged perspective view of a cut-out portion of the cleaning sheet shown in Fig. 1.

[Fig. 3] A schematic view that shows the entire production apparatus used effectively for

production of the cleaning sheet of the first working example of the present invention.

[Fig. 4] An enlarged perspective view of a cut-out portion of the cleaning sheet of the second working example of the present invention.

[Fig. 5] A top view of the cleaning sheet of the third working example of the present invention.

[Fig. 6] An enlarged perspective view of a cut-out portion of the cleaning sheet shown in Fig. 5.

[Fig. 7] An enlarged perspective view of a cut-out portion of the cleaning sheet of the fourth working example of the present invention.

[Fig. 8] A top view of the cleaning sheet of the fifth working example of the present invention.

[Fig. 9] A top view of the cleaning sheet of the sixth working example of the present invention.

[Explanation of codes]

10A-10F: Cleaning sheet (cleaning article)

11: Base sheet

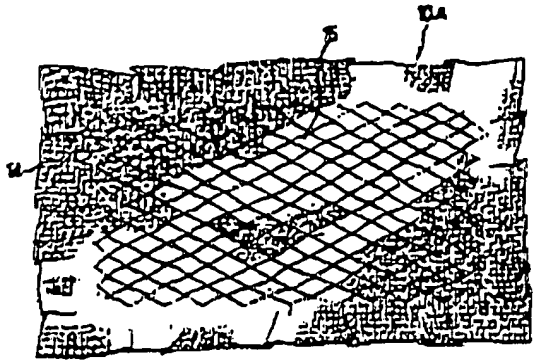
12: Foundation cloth

12A: Raised member

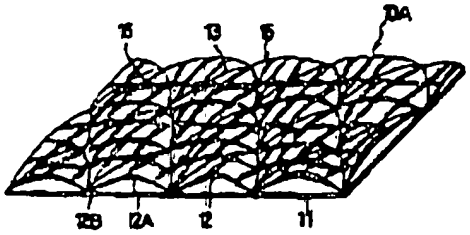
12C: Opening (slit opening)

16: Nonwoven fabric net

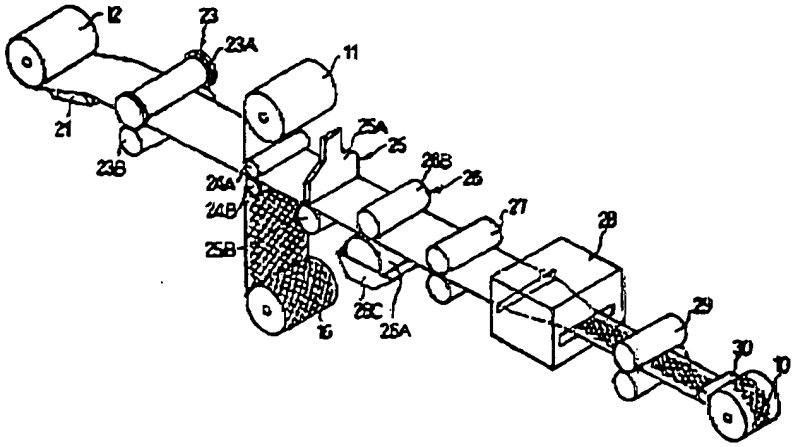
[Fig. 1]



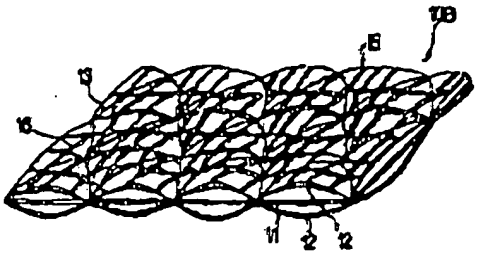
[Fig. 2]



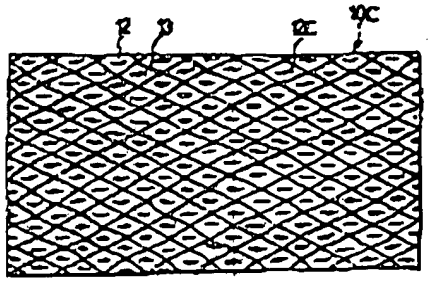
[Fig. 3]



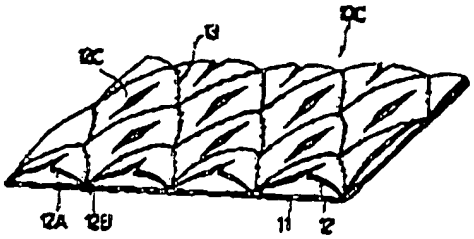
[Fig. 4]



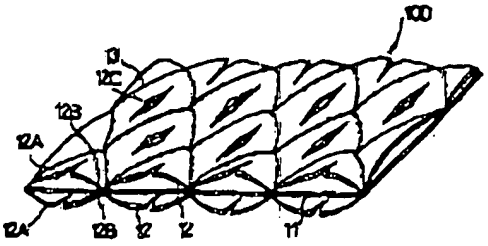
[Fig. 5]



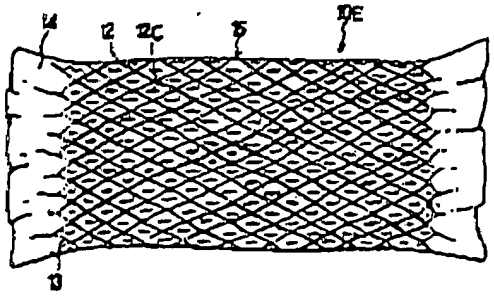
[Fig. 6]



[Fig. 7]



[Fig. 8]



[Fig. 9]